

**NIST Weights and Measures Division**  
**on the**  
**Development of Commercial Hydrogen Measurement Standards**  
**NHFCCSCC March 3, 2010**  
by Juana Williams

**(1) Use of SI Units (Metric) for Pressure - U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards [See NHFCCSCC Agenda Item 4]**

The following text is excerpted from the August 2008 USNWG meeting summary and "The Starting Point: A Discussion Paper Describing a Proposed Method of Sale and Quality Specification for Hydrogen Vehicle Fuel" (August, 2009). In August 2008, the USNWG Fuel Specifications Subcommittee (FSS) discussed the practice of marking the operating pressures for many hydrogen refueling dispensers in "bar" units as it relates to the development of Method of Sale requirements for hydrogen refueling applications. It is permissible to use the bar, a non-SI unit, where its use is part of an established practice. The bar is widely used in industry. However, the SI unit should be used first and then followed by the bar value. The FSS agreed on a conversion value in NIST SP 811 when the pressure value is derived from U.S. Customary units (psi).

The FSS modified its NIST Handbook 130 proposal for marking and labeling equipment and signage in specific units of measurement for pressure. The FSS recommends use of the "megapascal" or the abbreviation for that term "MPa" as the SI unit (metric) of measurement for labeling pressures on refueling equipment and corresponding price signage rather than using the term "bar." The numerical value for the pressure rating will follow the letter "H" which identifies the fuel as hydrogen (e.g., H35 or H70).

***Summary***

Knowing the service pressure of the dispenser is critical for consumers for safety, vehicle filing purposes, and because industry representatives on the USNWG have indicated that retailers may charge different prices based on the fuel's delivery pressure. The USNWG did consider that the bar is accepted for use with the International System of Units (SI), the metric system. However, it also acknowledged that the primary SI unit for pressure is the pascal. The USNWG agreed that using SI units, i.e., pascal, will be the only unit used to identify the dispenser service pressure. The USNWG agreed the use of the pascal would standardize industry practice and enable the display and posting of this information in a consistent manner. Establishing a uniform unit of measurement and acceptable terms for that term ensures the information is readily and clearly available during the sale and in the advertisement of a product. This practice allows for transparency in the transaction and the consumer to make value comparisons.

The documents the USNWG used for guidance on SI units are:

[Guide for the Use of International System of Units \(SI\) \(NIST SP 811, 2008 edition\)](#)

This document gives the rules and style conventions for printing and using units, unit symbols and SI prefix symbols. The publication includes an editorial checklist for reviewing manuscripts' conformity with the SI and the basic principles of physical quantities and units. Appendix A provides the definitions of the SI base units. Appendix B gives conversion factors for converting values of quantities expressed in units that are mainly unacceptable to use with the SI to values expressed mainly in units of the SI. Appendix B also includes a simplified discussion of rounding numbers and rounding converted numerical values of quantities. This 2008 edition supersedes NIST Special Publication 811, 1995 Edition, April 1995.

## [The International System of Units \(SI\) \(NIST SP 330, 2008\)](#)

This 2008 edition of NIST Special Publication (SP) 330 is the United States version of the English text of the eighth edition of the International Bureau of Weights and Measures (*Bureau International des Poids et Mesures* (BIPM)) SI Brochure (the most current) published in 2006. Its main purpose is to define and promote the SI. Appendix 1 chronologically lists the decisions that bear directly upon the definitions of the SI units, prefixes, and convention for writing of symbols and numbers. Appendix 2 (available only in electronic format from the BIPM) contains the practical realization about the definitions of some important units. Appendix 3 presents units used to measure actinic effects in biological materials. SP 330:2008 contains a few minor differences to reflect the most recent interpretation of the SI for the United States by the Secretary of Commerce, as published in the Federal Register of May 16, 2008 (73 FR 28432-28433). The 2008 edition of NIST SP 330 replaces its immediate predecessor, the 2001 edition.

Special Publication 811 and 330 are available for download from the NIST WMD web site at:

<http://ts.nist.gov/WeightsAndMeasures/index.cfm> go to “Publications” then click on “Weights and Measures Publications” or is available on the NIST WMD Metric Publications website at:

[http://ts.nist.gov/WeightsAndMeasures/Metric/mpo\\_pubs.cfm](http://ts.nist.gov/WeightsAndMeasures/Metric/mpo_pubs.cfm). Hard copies of both publications are available by contacting [TheSI@nist.gov](mailto:TheSI@nist.gov).

## **(2) NIST Technology Services, Weights and Measures Division-Metric Program**

The National Institute of Standards and Technology is a nonregulatory agency of the U.S. Department of Commerce. The Metric Program is part of the Laws and Metrics Group in NIST’s Weights and Measures Division that provides guidance and training to the states, Federal agencies, and industry on the uniform weights and measures laws and regulations adopted at the national level.

The Metric Program helps implement the national policy to establish the SI (International System of Units, commonly known as the metric system) as the preferred system of weights and measures for U.S. trade and commerce. It provides leadership and assistance on SI use and conversion to federal agencies, state and local governments, businesses, trade association, standards development organizations, educators, and the general public.

Because of the importance of the SI (metric system) as an international standard, its use in product design, manufacturing, marketing, and labeling is essential for U.S. industry’s success in the global marketplace. The NIST Metric Program encourages the use of the SI in all facets of education, including honing of worker skills.

The Metric Program coordinates metric transition activities under the Metric Conversion Act, including transition of all federal agencies (Executive Order 12770). U.S. metric legislation and policy authorizes Secretary of Commerce to direct and coordinate the federal agency metric transition and to assess progress. Federal agencies implement formal policy and plans for using the SI (metric system) and report transition progress. The use of the SI in federal agency programs relating to trade, industry, and commerce is intended to support industry’s voluntary adoption of the SI.

## **(3) Upcoming Hydrogen Events**

On March 11, 2010 from 8:30 a.m. to 11:30 a.m., NIST Weights and Measures Division will provide a presentation to the Indiana Weights and Measures Association in Carmel, Indiana on “Commercial Hydrogen Measurement” to familiarize state, county, and local weights and measures officials and industry with the ongoing work on hydrogen- measuring devices and other legal metrology codes, refueling equipment, fuel cell vehicles, safety, properties, and other relevant facts.